

## PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION  
(PCT Rule 61.2)Date of mailing (day/month/year)  
18 October 1999 (18.10.99)

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

International application No.  
PCT/US99/04776Applicant's or agent's file reference  
31596-PCTInternational filing date (day/month/year)  
04 March 1999 (04.03.99)Priority date (day/month/year)  
04 March 1998 (04.03.98)

## Applicant

CHANG, Shih-Fu et al

## 1. The designated Office is hereby notified of its election made:

 in the demand filed with the International Preliminary Examining Authority on:

22 September 1999 (22.09.99)

 in a notice effecting later election filed with the International Bureau on:2. The election  was was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

BEST AVAILABLE COPY

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Authorized officer

Kiwa Mpay

Facsimile No.: (41-22) 740.14.35

Telephone No.: (41-22) 338.83.38

2902705

## PATENT COOPERATION TREATY

PCT

REC'D 03 JUL 2000

WIPO

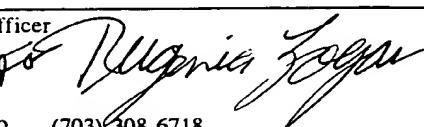
PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 31596-PCT	FOR FURTHER ACTION      See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/04776	International filing date (day/month/year) 04 MARCH 1999	Priority date (day/month/year) 04 MARCH 1998
International Patent Classification (IPC) or national classification and IPC IPC(7): G06F 17/30; 19/00 and US Cl.: 707/3,4,46,100,104		
Applicant THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK		

<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>4</u> sheets.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>0</u> sheets.</p> <p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the report</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of report with regard to novelty, inventive step or industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input type="checkbox"/> Certain defects in the international application</li> <li>VIII <input type="checkbox"/> Certain observations on the international application</li> </ul>
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Date of submission of the demand 22 SEPTEMBER 1999	Date of completion of this report 25 MAY 2000
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	<p>Authorized officer KIM VU </p> <p>Telephone No. (703) 308-6718</p>

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/04776

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

 the international application as originally filed the description:pages 1-12, as originally filedpages NONEpages NONE, filed with the demand the claims:pages 13-16, as originally filedpages NONE, as amended (together with any statement) under Article 19pages NONE, filed with the demandpages NONE, filed with the letter of \_\_\_\_\_ the drawings:pages 1-3, as originally filedpages NONE, filed with the demandpages NONE, filed with the letter of \_\_\_\_\_ the sequence listing part of the description:pages NONE, as originally filedpages NONE, filed with the demandpages NONE, filed with the letter of \_\_\_\_\_

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

 the language of a translation furnished for the purposes of international search (under Rule 23.1(b)). the language of publication of the international application (under Rule 48.3(b)). the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

 contained in the international application in printed form. filed together with the international application in computer readable form. furnished subsequently to this Authority in written form. furnished subsequently to this Authority in computer readable form. The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished. The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4.  The amendments have resulted in the cancellation of: the description, pages NONE the claims, Nos. NONE the drawings, sheets <sup>fig</sup> NONE5.  This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\*Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/04776

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. statement**

Novelty (N)	Claims <u>1-18</u>	YES
	Claims <u>19-24</u>	NO
Inventive Step (IS)	Claims <u>NONE</u>	YES
	Claims <u>1-24</u>	NO

Industrial Applicability (IA)	Claims <u>1-24</u>	YES
	Claims <u>NONE</u>	NO

**2. citations and explanations (Rule 70.7)**

Claims 1-24 lack of inventive step under PCT Article 33(3) as being obvious over Balogh (US Pat. No. 5,493,677) in view of Okamoto (US Pat. No. 5,708,805).

As per claims 1, 7, 13, and 19 Balogh discloses a method comprising of obtaining at least one initial query for the concept (see, col. 15, lines 12-14);

generating at least one additional query related to the initial query (see, col. 3, lines 4-6);  
 producing the additional query for inspection for appropriateness with respect to the concept (see, col. 10, lines 23-28);  
 displaying the information (see, col. 17, lines 45-46). But, he does not specifically disclose a method of including the additional query in the visual template for the concept. However, Okamoto discloses a method of images contain more information and are more concrete or real than natural language, many images are employed in various documents (see, col. 1, lines 11-13).

It would have been obvious to a person of ordinary skill in the art at the time the Applicant's invention was made to modify the teachings of Balogh with including the additional query in the visual template for the concept as disclosed by Okamoto, because such modification would provide the system to the degree of similarity with the image retrieving information (see, col. 1, lines 54-56).

As per claims 2, 5, 14, and 17 Balogh discloses a method wherein each query is represented by an icon/example image (see, figure 14, col. 17, lines 14-16).

As per claims 3, 8, 15, and 20 Balogh discloses a method wherein the textual query is obtained from a keyboard (see, cols. 13, and 17, lines 43-53, and 2-6).

As per claims 4, 9, 16, and 21, the limitations of claims 4, 9, 16, and 21 have been mentioned in the analysis of claim 1 above. They are, therefore, lack of inventive step.

(Continued on Supplemental Sheet.)

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

**1. BASIS OF REPORT:**

5. (Some) amendments are considered to go beyond the disclosure as filed:  
NONE

**V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):**

As per claims 6, 10, 18, and 22 Balogh discloses a method wherein appropriateness is ascertained by two-way interaction between the system and a user (see, abstract, lines 5-8).

As per claims 11, and 23 Balogh discloses a method wherein establishing a correspondence between the query and the natural language subset (see, col. 18, lines 38-45);

labeling different parts of the query as a noun, verb, adjective or preposition (see, col. 14, lines 40-59);  
obtaining clarification if a word in the query is absent from the natural language subset and labeling the word accordingly (see, col. 1, lines 9-12).

As per claims 12, and 24,  
the limitations of claims 12, and 24 have been noted in the analysis of claim 1 above. They are, therefore, lack of inventive step.

-----NEW CITATIONS-----  
NONE

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: HENRY TANG  
BAKER & BOTTS, LLP  
30 ROCKEFELLER PLAZA  
NEW YORK NY 10112-0228

PCT

WRITTEN OPINION

(PCT Rule 66)

DRAFT  
JIT  
KHD

Date of Mailing  
(day/month/year)

**29 NOV 1999**

Applicant's or agent's file reference  
31596-PCT

REPLY DUE

within TWO months  
from the above date of mailing

International application No.  
PCT/US99/04776

International filing date (day/month/year)  
04 MARCH 1999

Priority date (day/month/year)  
04 MARCH 1998

International Patent Classification (IPC) or both national classification and IPC  
IPC(6): G06F 17/30; 19/00 and US Cl.: 707/3,4,46,100,104

Applicant  
THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

1. This written opinion is the first (first, etc.) drawn by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I  Basis of the opinion
- II  Priority
- III  Non-establishment of opinion with regard to novelty, inventive step or industrial applicability
- IV  Lack of unity of invention
- V  Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI  Certain documents cited
- VII  Certain defects in the international application
- VIII  Certain observations on the international application

Docketed

For 1 129 12000 By

3. The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4. For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.

For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 04 JULY 2000

Name and mailing address of the IPEA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

WAYNES AMSBURY

Telephone No. (703) 305-3828

**I. Basis of the opinion**

1. This opinion has been drawn on the basis of (Substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".):

the international application as originally filed.

the description, pages 1-12 as originally filed.  
pages NONE, filed with the demand.  
pages NONE, filed with the letter of \_\_\_\_\_.

the claims, Nos. 1-24, as originally filed.  
Nos. NONE, as amended under Article 19.  
Nos. NONE, filed with the demand.  
Nos. NONE, filed with the letter of \_\_\_\_\_.

the drawings, sheets/fig 1-3 as originally filed.  
sheets/fig NONE, filed with the demand.  
sheets/fig NONE, filed with the letter of \_\_\_\_\_.

2. The amendments have resulted in the cancellation of:

the description, pages NONE

the claims, Nos. NONE

the drawings, sheets/fig NONE

3.  This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box Additional observations below (Rule 70.2(c)).

4. Additional observations, if necessary:

NONE

## V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. STATEMENT

Novelty (N)	Claims	1-18	YES
	Claims	19-24	NO
Inventive Step (IS)	Claims	NONE	YES
	Claims	1-24	NO
Industrial Applicability (IA)	Claims	1-24	YES
	Claims	NONE	NO

## 2. CITATIONS AND EXPLANATIONS

Claims 1-24 lack of inventive step under PCT Article 33(3) as being obvious over Balogh (US Pat. No. 5,493,677) in view of Okamoto (US Pat. No. 5,708,805).

As per claims 1, 7, 13, and 19 Balogh discloses a method comprising of obtaining at least one initial query for the concept (see, col. 15, lines 12-14);

generating at least one additional query related to the initial query (see, col. 3, lines 4-6);

producing the additional query for inspection for appropriateness with respect to the concept (see, col. 10, lines 23-28);

displaying the information (see, col. 17, lines 45-46). But, he does not specifically disclose a method of including the additional query in the visual template for the concept. However, Okamoto discloses a method of images contain more information and are more concrete or real than natural language, many images are employed in various documents (see, col. 1, lines 11-13).

It would have been obvious to a person of ordinary skill in the art at the time the Applicant's invention was made to modify the teachings of Balogh with including the additional query in the visual template for the concept as disclosed by Okamoto, because such modification would provide the system to the degree of similarity with the image retrieving information (see, col. 1, lines 54-56).

As per claims 2, 5, 14, and 17 Balogh discloses a method wherein each query is represented by an icon/example image (see, figure 14, col. 17, lines 14-16).

As per claims 3, 8, 15, and 20 Balogh discloses a method wherein the textual query is obtained from a keyboard (see, cols. 13, and 17, lines 43-53, and 2-6).

As per claims 4, 9, 16, and 21, the limitations of claims 4, 9, 16, and 21 have been mentioned in the analysis of claim 1 above. They are, therefore, lack of inventive step.

(Continued on Supplemental Sheet.)

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

**TIME LIMIT:**

The time limit set for response to a Written Opinion may not be extended. 37 CFR 1.484(d). Any response received after the expiration of the time limit set in the Written Opinion will not be considered in preparing the International Preliminary Examination Report.

**V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):**

As per claims 6, 10, 18, and 22 Balogh discloses a method wherein appropriateness is ascertained by two-way interaction between the system and a user (see, abstract, lines 5-8).

As per claims 11, and 23 Balogh discloses a method wherein establishing a correspondence between the query and the natural language subset (see, col. 18, lines 38-45);

labeling different parts of the query as a noun, verb, adjective or preposition (see, col. 14, lines 40-59);  
obtaining clarification if a word in the query is absent from the natural language subset and labeling the word accordingly (see, col. 1, lines 9-12).

As per claims 12, and 24,  
the limitations of claims 12, and 24 have been noted in the analysis of claim 1 above. They are, therefore, lack of inventive step.

----- NEW CITATIONS -----  
NONE

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/04776

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G06P 17/30; 19/00  
US CL : 707/3,4,46,100,104

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 707/3,4,46,100,104

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS, IS&amp;R, EIC

SEARCH TERMS: VISUAL, IMAGE, NATURAL LANGUAGE, RETRIEVE, SVT

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,493,677 A (BALOGH et al.) 20 February 1996, col. 14, lines 40-59.	1-24
Y	US 5,724,484 A (KAGAMI et al.) 03 March 1998, col. 8, lines 47-60.	1-24
Y	US 5,708,805 A (OKAMOTO et al.) 13 January 1998, col. 1, lines 30-49.	1-24

 Further documents are listed in the continuation of Box C. See patent family annex.

Special categories of cited documents:	
*A*	document defining the general state of the art which is not considered to be of particular relevance
*E*	earlier document published on or after the international filing date
*L*	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
*O*	document referring to an oral disclosure, use, exhibition or other means
*P*	document published prior to the international filing date but later than the priority date claimed
*T*	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*&*	document member of the same patent family

Date of the actual completion of the international search

29 APRIL 1999

Date of mailing of the international search report

14 MAY 1999

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703) 308-5403

Authorized officer

PAUL R. LINTZ

Telephone No. (703) 305-3832

**PATENT COOPERATION TREATY**

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT/1999/0402

To:

HENRY TANG  
BAKER & BOTTS, LLP  
30 ROCKEFELLER PLAZA  
NEW YORK NY 10112-0228

PCT 15 PM 3:19

**NOTIFICATION OF RECEIPT  
OF DEMAND BY COMPETENT INTERNATIONAL  
PRELIMINARY EXAMINING AUTHORITY**

(PCT Rule 59.3(e) and 61.1(b), first sentence  
and Administrative Instructions, Section 601(a))

Date of mailing  
(day/month/year)

12 OCT 1999

Applicant's or agent's file reference  
31596-PCT

**IMPORTANT NOTIFICATION**

International application No.  
PCT/US99/04776

International filing date (day/month/year)  
04 MAR 99

Priority date (day/month/year)  
04 MAR 98

Applicant

THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF  
NEW YORK

1. The applicant is hereby notified that this International Preliminary Examining Authority considers the following date as the date of receipt of the demand for international preliminary examination of the international application:

**22 SEP 1999**

**(22.09.99)**

2. That date of receipt is:

the actual date of receipt of the demand by this Authority (Rule 61.1(b)).  
 the actual date of receipt of the demand on behalf of this Authority (Rule 59.3(e)).  
 the date on which this Authority has, in response to the invitation to correct defects in the demand (Form PCT/IPEA/404), received the required corrections.

3.  **ATTENTION:** That date of receipt is AFTER the expiration of 19 months from the priority date. Consequently, the election(s) made in the demand does (do) not have the effect of postponing the entry into the national phase until 30 months from the priority date (or later in some Offices) (Article 39(1)). Therefore, the acts for entry into the national phase must be performed within 20 months from the priority date (or later in some Offices) (Article 22). For details, see the *PCT Applicant's Guide*, Volume II.

(If applicable) This notification confirms the information given by telephone, facsimile transmission or in person on:

4. Only where paragraph 3 applies, a copy of this notification has been sent to the International Bureau.

Name and mailing address of the IPEA/US  
Assistant Commissioner for Patents  
Box PCT  
Washington, D.C. 20231  
Facsimile No.

Attn: IPEA/US

Authorized officer

Tyetta Young  
PCT/Internat'l Appl Processing Off  
17091 305 3671

*Ty*

## PATENT COOPERATION TREATY

31596  
PCT

PCT

NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

Date of mailing (day/month/year)  
10 September 1999 (10.09.99)Applicant's or agent's file reference  
31596-PCTInternational application No.  
PCT/US99/04776International filing date (day/month/year)  
04 March 1999 (04.03.99)Priority date (day/month/year)  
04 March 1998 (04.03.98)

## Applicant

THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK et al

## IMPORTANT NOTICE

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
EP,JP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

CA

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 10 September 1999 (10.09.99) under No. WO 99/45483

## REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a **demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

## REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

DOCKETED

FOR 11/16/1999 BY

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer J. Zahra Telephone No. (41-22) 338.83.38
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31596  
PCT

## PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF RECEIPT OF  
RECORD COPY

(PCT Rule 24.2(a))

To:

TANG, Henry  
 Baker & Botts, LLP  
 30 Rockefeller Plaza  
 New York, NY 10112-0228  
 ÉTATS-UNIS D'AMÉRIQUE

RECEIVED  
 BAKER & BOTTS, LLP.

99 MAY 19 AM 10:33

Date of mailing (day/month/year) 26 April 1999 (26.04.99)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 31596-PCT	International application No. PCT/US99/04776

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK (for all designated States except SU)  
 CHANG, Shih-Fu et al (for US)

International filing date : 04 March 1999 (04.03.99)

Priority date(s) claimed : 04 March 1998 (04.03.98)

Date of receipt of the record copy by the International Bureau : 13 April 1999 (13.04.99)

List of designated Offices :

EP :AT,BE,CH,CY,DE,DK,ES,FI,FR,GB,GR,IE,IT,LU,MC,NL,PT,SE  
 National :CA,JP,KR,US

## ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- time limits for entry into the national phase
- confirmation of precautionary designations
- requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

COPY TO  
Chang S13

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. (41-22) 740.14.35	Authorized officer: Philippe Bécamel  Telephone No. (41-22) 338.83.38
--	--

**INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE**

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is **20 MONTHS** from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, **30 MONTHS** from the priority date, provided that the election is made before the expiration of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. It is the applicant's responsibility to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.

GR and ES became bound by PCT Chapter II on 7 September 1996 and 6 September 1997, respectively, and may, therefore, be elected in a demand or a later election filed on or after 7 September 1996 and 6 September 1997, respectively, regardless of the filing date of the international application. (See second paragraph above.)

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**CONFIRMATION OF PRECAUTIONARY DESIGNATIONS**

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

**REQUIREMENTS REGARDING PRIORITY DOCUMENTS**

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity to furnish the priority document within a time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

The demand must be filed directly with one competent International Preliminary Examining Authority or, if two or more Authorities are with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line IPEA/ US

# PCT

## CHAPTER II

### DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA		Date of receipt of DEMAND
<b>Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION</b>		
International application No. PCT/US99/04776		Applicant's or agent's file reference 31596-PCT
International filing date (day/month/year) 04 March 1999		(Earliest) Priority date (day/month/year) ( 04.03.99 ) 04 March 1998 ( 04.03.98 )
Title of invention METHOD AND SYSTEM FOR GENERATING SEMANTIC VISUAL TEMPLATES FOR IMAGE AND VIDEO RETRIEVAL		
<b>Box No. II APPLICANT(S)</b>		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)  THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK 116th Street and Broadway New York, NY 10027 US		Telephone No.:  Facsimile No.:  Teleprinter No.:
State (that is, country) of nationality: US		State (that is, country) of residence: US
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)  CHANG, SHIH-FU 560 Riverside Drive, Apt. 18K New York, NY 10027 US		
State (that is, country) of nationality: TW		State (that is, country) of residence: US
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)  CHEN, WILLIAM 423 West 112th Street, Apt. 34A New York, NY 10027 US		
State (that is, country) of nationality: US		State (that is, country) of residence: US
<input checked="" type="checkbox"/> Further applicants are indicated on a continuation sheet.		

## Continuation of Box No. II APPLICANT(S)

*If none of the following sub-boxes is used, this sheet is not to be included in the demand.*

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SUNDARAM, HARI  
434 West 120th Street, Apt. 9D  
New York, NY 10027  
US

State *(that is, country)* of nationality:State *(that is, country)* of residence:

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:State *(that is, country)* of residence:

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:State *(that is, country)* of residence:

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:State *(that is, country)* of residence:

Further applicants are indicated on another continuation sheet.

**Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The following person is  agent  common representative

and  has been appointed earlier and represents the applicant(s) also for international preliminary examination.

is hereby appointed and any earlier appointment of (an) agent(s) /common representative is hereby revoked.

is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official  
The address must include postal code and name of country.)*

TANG, HENRY and  
BUSINGER, PETER A.  
Baker & Botts, LLP  
30 Rockefeller Plaza  
New York, NY 10112-0228  
US

Telephone No.:  
(212) 705-5000

Faxsimile No.:  
(212) 705-5020

Teleprinter No.:

Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION****Statement concerning amendments:\***

1. The applicant wishes the international preliminary examination to start on the basis of:

the international application as originally filed.

the description  as originally filed  
 as amended under Article 34

the claims  as originally filed  
 as amended under Article 19 (together with any accompanying statement)  
 as amended under Article 34

the drawings  as originally filed  
 as amended under Article 34

2.  The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3.  The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

\* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

**Language for the purposes of international preliminary examination: English**

which is the language in which the international application was filed.  
 which is the language of a translation furnished for the purposes of international search.  
 which is the language of publication of the international application.  
 which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

**Box No. V ELECTION OF STATES**

The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

## Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:			For International Preliminary Examining Authority use only	
			received	not received
1. translation of international application	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
2. amendments under Article 34	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
3. copy (or where required, translation) of amendments under Article 19	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
4. copy (or, where required, translation) of statement under Article 19	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
5. letter	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
6. other (specify)	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

1. <input checked="" type="checkbox"/> fee calculation sheet	4. <input type="checkbox"/> statement explaining lack of signature
2. <input type="checkbox"/> separate signed power of attorney	5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form
3. <input type="checkbox"/> copy of general power of attorney; reference number, if any:	6. <input checked="" type="checkbox"/> other (specify): Transmittal Letter

## Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).



Peter A. Businger  
(Agent)

## For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3.  The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply.  The applicant has been informed accordingly.
4.  The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5.  Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

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Demand received from IPEA on:

## PCT

## FEE CALCULATION SHEET

## Annex to the Demand for international preliminary examination

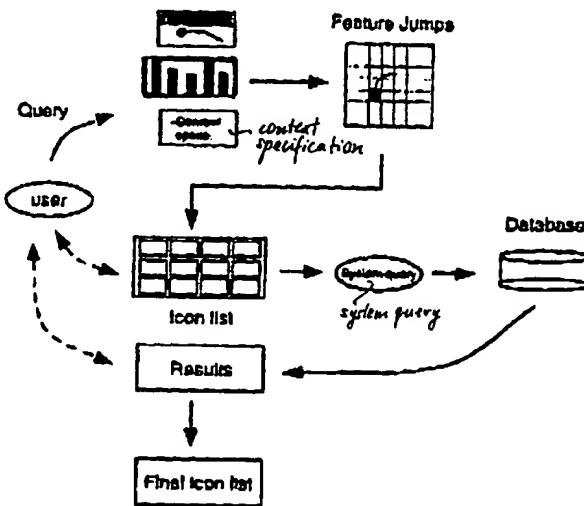
International application No.	PCT/US99/04776	For International Preliminary Examining Authority use only
Applicant's or agent's file reference	31596-PCT	Date stamp of the IPEA
Applicant THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK		
Calculation of prescribed fees		
1. Preliminary examination fee .....	490.00	P
2. Handling fee ( <i>Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.</i> ) .....	162.00	H
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box .....	652.00	
	TOTAL	
Mode of Payment		
<input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash	
<input checked="" type="checkbox"/> cheque	<input type="checkbox"/> revenue stamps	
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Deposit Account Authorization ( <i>this mode of payment may not be available at all IPEAs</i> )		
The IPEA/ <u>US</u>	<input type="checkbox"/>	is hereby authorized to charge the total fees indicated above to my deposit account.
<input checked="" type="checkbox"/> ( <i>this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit</i> ) is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.		
02-4377	22 September 1999	<u>Pete A. Breninger</u>
Deposit Account Number	Date (day/month/year)	Signature

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : <b>G06F 17/30, 19/00</b>		A1	(11) International Publication Number: <b>WO 99/45483</b>
			(43) International Publication Date: 10 September 1999 (10.09.99)
(21) International Application Number: <b>PCT/US99/04776</b>		(81) Designated States: CA, JP, KR, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) International Filing Date: 4 March 1999 (04.03.99)			
(30) Priority Data: 60/076,781 4 March 1998 (04.03.98) US		Published <i>With international search report.</i>	
(71) Applicant (for all designated States except US): THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK [US/US]; 116th Street and Broadway, New York, NY 10027 (US).			
(72) Inventors; and			
(75) Inventors/Applicants (for US only): CHANG, Shih-Fu [-/US]; Apartment 18K, 560 Riverside Drive, New York, NY 10027 (US). CHEN, William [US/US]; Apartment 34A, 423 West 112th Street, New York, NY 10027 (US). SUNDARAM, Hari [IN/US]; Apartment 9D, 434 West 120th Street, New York, NY 10027 (US).			
(74) Agents: TANG, Henry et al.; Baker & Botts, LLP, 30 Rockefeller Plaza, New York, NY 10112-0228 (US).			

(54) Title: METHOD AND SYSTEM FOR GENERATING SEMANTIC VISUAL TEMPLATES FOR IMAGE AND VIDEO RETRIEVAL



## (57) Abstract

For database image/video retrieval, a semantic visual template (SVT) is a set of icons of example scenes/objects that characterize a concept, e.g. skiing, sunset and the like. SVTs provide for two-way interaction between a user and a system. The user can provide the system with an initial sketch or example image, as a seed to the system to automatically generate other representations of the same concept. The user then can pick those views for inclusion that are plausible for representing the concept. When an SVT has been established, the database can be searched with it, for the user to provide relevancy feedback on the returned results. With established SVTs, the user can interact with the system at concept level. In forming new concepts, pre-existing SVTs can be used. A limited vocabulary can be parsed, in conjunction with semantic visual templates for querying the system.

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DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/04776

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G06F 17/30; 19/00  
US CL : 707/3.4, 46, 100, 104

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 707/3.4, 46, 100, 104

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS, IS&amp;R, EIC

SEARCH TERMS: VISUAL, IMAGE, NATURAL LANGUAGE, RETRIEVE, SVT

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,493,677 A (BALOGH et al.) 20 February 1996, col. 14, lines 40-59.	1-24
Y	US 5,724,484 A (KAGAMI et al.) 03 March 1998, col. 8, lines 47-60.	1-24
Y	US 5,708,805 A (OKAMOTO et al.) 13 January 1998, col. 1, lines 30-49.	1-24

 Further documents are listed in the continuation of Box C. See patent family annex.

• Special categories of cited documents:	
•A• document defining the general state of the art which is not considered to be of particular relevance	•T• later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
•E• earlier document published on or after the international filing date	•X• document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
•L• document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	•Y• document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
•O• document referring to an oral disclosure, use, exhibition or other means	
•P• document published prior to the international filing date but later than the priority date claimed	•&• document member of the same patent family

Date of the actual completion of the international search

29 APRIL 1999

Date of mailing of the international search report

14 MAY 1999

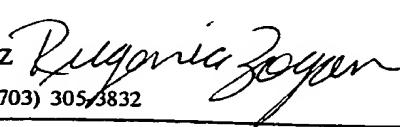
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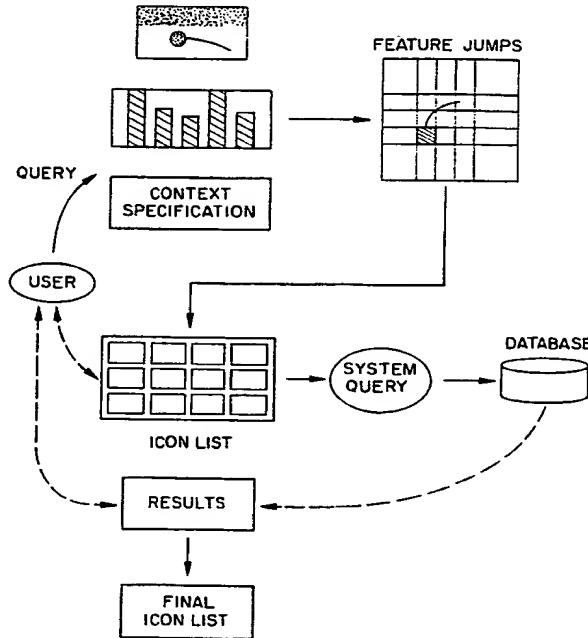




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>G06F 17/30, 19/00</b>	A1	(11) International Publication Number: <b>WO 99/45483</b> (43) International Publication Date: 10 September 1999 (10.09.99)
(21) International Application Number: PCT/US99/04776		(81) Designated States: CA, JP, KR, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
(22) International Filing Date: 4 March 1999 (04.03.99)		
(30) Priority Data: 60/076,781 4 March 1998 (04.03.98) US		Published <i>With international search report.</i>
(71) Applicant (for all designated States except US): THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK [US/US]; 116th Street and Broadway, New York, NY 10027 (US).		
(72) Inventors; and		
(75) Inventors/Applicants (for US only): CHANG, Shih-Fu [-/US]; Apartment 18K, 560 Riverside Drive, New York, NY 10027 (US). CHEN, William [US/US]; Apartment 34A, 423 West 112th Street, New York, NY 10027 (US). SUNDARAM, Hari [IN/US]; Apartment 9D, 434 West 120th Street, New York, NY 10027 (US).		
(74) Agents: TANG, Henry et al.; Baker & Botts, LLP, 30 Rockefeller Plaza, New York, NY 10112-0228 (US).		

(54) Title: METHOD AND SYSTEM FOR GENERATING SEMANTIC VISUAL TEMPLATES FOR IMAGE AND VIDEO RETRIEVAL



(57) Abstract

For database image/video retrieval, a semantic visual template (SVT) is a set of icons of example scenes/objects that characterize a concept, e.g. skiing, sunset and the like. SVTs provide for two-way interaction between a user and a system. The user can provide the system with an initial sketch or example image, as a seed to the system to automatically generate other representations of the same concept. The user then can pick those views for inclusion that are plausible for representing the concept. When an SVT has been established, the database can be searched with it, for the user to provide relevancy feedback on the returned results. With established SVTs, the user can interact with the system at concept level. In forming new concepts, pre-existing SVTs can be used. A limited vocabulary can be parsed, in conjunction with semantic visual templates for querying the system.

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EE	Estonia						

## METHOD AND SYSTEM FOR GENERATING SEMANTIC VISUAL TEMPLATES FOR IMAGE AND VIDEO RETRIEVAL

### Technical Field

The invention relates to database still image, video and audio retrieval and, more particularly, to techniques which facilitate access to database items.

### Background of the Invention

5 Increasingly, as images and videos are produced, disseminated and stored in digital form, tools and systems for searching and retrieving visual information are becoming important. However, while efficient "search engines" have become widely available for text data, corresponding tools for searching for visual image and video data have remained elusive.

10 Typically, in available image and video databases, keyword techniques are used to index and retrieve images. Known retrieval systems of this type suffer from a number of drawbacks, as images may not be associated with textual information, as manual inclusion of captions is time consuming and subjective, and as textual annotations are usually extrinsic, failing to represent the intrinsic visual  
15 characteristics of a scene. For example, a textual description such as "A man stands against a brick wall" conveys little visual information about either the man or the brick wall. Such visual information is often vital in retrieving a particular video.

20 Recently, researchers have begun to explore new forms of image and video repository retrieval. Such exploration is based on similarity of visual attributes, e.g. color, texture, shape and spatial and temporal relationships amongst the objects that make up a video. In this paradigm, queries are usually specified by giving an example image or a visual sketch. Then, retrieval systems return the image or video that have the highest similarity to the given example or sketch.

### Summary of the Invention

25 For ease of retrieval of images and videos from a database, the database can be indexed using a collection of visual templates. Preferably, in accordance with an aspect of the invention, the visual templates represent semantic concepts or categories, e.g. skiing, sunset and the like. There results an architecture using semantic visual templates (SVT), with each SVT standing for a concept and  
30 consisting of queries that describe the concept well.

Semantic visual templates can be established by an interactive process between a user and a system. The user can provide the system with an initial sketch or example image, as a seed to the system to automatically generate other representations of the same concept. The user then can pick those views for inclusion

that are plausible for representing the concept. When an SVT has been established, the database can be searched with it, for the user to provide relevancy feedback on the returned results. With established SVT's, the user can interact with the system at concept level. In forming new concepts, pre-existing SVT's can be used..

5        Provided further is a technique for parsing a limited vocabulary of words in conjunction with semantic visual templates for querying the system.

#### Brief Description of the Drawing

Fig. 1 is a schematic of an interactive technique for generating a library or collection of semantic visual templates in accordance with a preferred embodiment of the invention.

10      Fig. 2 is a diagram which illustrates a concept having necessary and sufficient conditions.

Fig. 3 is a diagram which illustrates query generation.

15      Fig. 4 is a schematic of an interactive system in accordance with a preferred further embodiment of the invention, including audio processing.

Fig. 5 shows a set of icons exemplifying the concept "high jump".

Fig. 6 shows a set of icons exemplifying the concept "sunset".

Fig. 7 shows a semantic visual template for the concept "slalom"

#### Detailed Description

Incorporated herein by reference are U.S. provisional patent application No. 60/045,637, filed May 5, 1997 and PCT International Application No. PCT/US98/09124 filed May 5, 1998 wherein Canada, Japan, the Republic of Korea and the United States of America are designated, describing techniques for object-based spatial and temporal visual searching using visual templates to search for images and video in different categories. Such search techniques, referred to as VideoQ, can be used in conjunction with the present invention.

25      In a video stream, the beginning and end of a scene can be determined using VideoQ, for example, which technique can be used further to compensate for camera motion for extracting objects in the scene. Still using VideoQ, each object can be characterized by salient attributes such as color, texture, size, shape and motion, for example. There results a video object database consisting of all the objects extracted from the scene and their attributes.

#### Visual Templates

30      A visual template represents an idea, in the form of a sketch or an animated sketch. As a single visual template may be a poor representative of a class of interest,

a library of visual templates can be assembled, containing representative templates for different semantic classes. For example, when searching for video clips of the class *Sunset*, one could select one or more visual templates corresponding to the class and use similarity-based querying to find video clips of sunsets.

5 An important advantage of using a visual template library lies in linkage of a low-level visual feature representation to high-level semantic concepts. For example, if a user enters a query in a constrained natural language form as described in the above-referenced patent applications, visual templates can be used to transform the natural language query into automated queries specified by visual attributes and  
10 constraints. When visual content in the repository or database is not indexed textually, customary textual search methods cannot be applied directly.

#### Semantic Visual Templates (SVT)

A semantic visual template is the set of visual templates associated with a particular semantic. This notion of an SVT has certain key properties as follows:

15 Semantic visual templates are general in nature. For a given concept, there should be a set of visual templates that cover that concept well. Examples of successful SVT's are *Sunset*, *High Jump*, *Down-hill Skiing*.

20 A semantic visual template for a concept should be small but cover a large percentage of relevant images and videos in the collection, for high precision-recall performance.

25 Our procedures for finding semantic visual templates for different concepts are systematic, efficient, and robust. Efficiency refers to the convergence to a small visual template set. Robustness is demonstrated by applying the new library of templates to new image and video collections.

30 With reference to VideoQ, a semantic visual template can be understood further as a set of icons or example scenes/objects that represent the semantic with which the template is associated. From a semantic visual template, feature vectors can be extracted for querying. The icons are animated sketches. In VideoQ, the features associated with each object and their spatial and temporal relationships are important. Histograms, texture and structural information are examples of global features that can be part of such a template. The choice between an icon-based realization versus a feature vector set formed out of global characteristics depends upon the semantic to be represented. For example, a sunset scene may be adequately represented by a couple of objects, while a waterfall or a crowd is better represented using a global feature set. Hence, each template contains multiple icons, example scenes/objects to represent a concept. The elements of the set can overlap in their coverage. Desirably, coverage is maximized with a minimal template set.

Each icon for a concept, e.g. down-hill ski, sunset, beach crowd, is a visual representation consisting of graphic objects resembling the actual objects in a scene. Each object is associated with a set of visual attributes, e.g. color, shape, texture, motion. The relevancy of each attribute and each object to the concept is also 5 specified. For example, for "sunset", color and spatial structures of the objects such as sun and sky are more relevant. For a sunset scene, the sun object may be optional, as there may be sunset videos in which the sun is not visible. For the concept "high 10 jump", the motion attribute of the foreground object is mandatory, the texture attribute of the background is non-mandatory, and both are more relevant than other attributes. Some concepts may need just one object to represent the global attributes of the scene.

Fig. 5 shows several potential icons for "high jump", and Fig. 6 for "sunset". The optimal set of icons should be chosen based on relevancy feedback and maximal coverage in terms of recall as described below in further detail.

15 We have devised efficient techniques for generating semantic visual templates for various concepts. Each semantic concept may have a few representative visual templates, which can be used to retrieve a significant portion of images and video, for positive coverage or high recall from the repository. The positive coverage sets for different visual templates may overlap. Therefore, it is an objective to find a small set 20 of visual templates with large, minimally overlapping positive coverage.

25 Users may provide initial conditions for effective visual templates. For example, a user may use a yellow circle (foreground) and a light-red rectangle (background) as an initial template for retrieving sunset scenes. Also, users may indicate weights and relevancy of different objects, attributes, and necessary conditions pertaining to the context by answering an interactive questionnaire. The questionnaire is sensitive to the current query that the user has sketched out on a sketchpad, for example.

Given the initial visual template and relevancy of all visual attributes in the 30 template, the search system will return a set of most similar images/video to the user. Given the returned results, the user can provide subjective evaluation of the returned results. The precision of the results and positive coverage, i.e. recall can be computed.

The system can determine an optimal strategy for altering the initial visual query and generate modified queries based on:

35 1. The relevancy factor of each visual attribute obtained by the user questionnaire,

2. Precision-recall performance of the previous query,  
and

3. Information about feature level distribution of images and video in the repository.

Such features are embodied in a technique as conceptually exemplified by Fig. 1, with specific illustration of a query for the concept "high jump". The query includes three objects, namely two stationary rectangular background fields and an object which moves to the lower right. For each object in the query, four qualities are specified with associated weights, e.g. color, texture, shape and size, represented in Fig. 1 by vertical bars. A new query can be formed by stepping at least one of the qualities, at which point user interaction can be invoked for deciding as to plausibility for inclusion as an icon in the template. Once a suitable number of icons have been assembled into a tentative template, this template can be used for a database search. The results of the search can be evaluated for recall and precision. If acceptable, the template can be stored as a semantic visual template for "high jump".

Template Metric

15 The fundamental video data unit may be termed a video shot, comprising multiple segmented video objects. The lifetime of any particular video object may be equal to or less than the duration of the video shot. A similarity measure  $D$  between a member of the SVT set and a video shot can be defined as

$$D = \min \{ \omega_f \cdot \sum_{\{i\}} d_f(O_i, O'_i) + \omega_s \cdot d_s \} \quad (1)$$

20 where the  $O_i$  are the objects specified in the template,  $O'_i$  are the matched objects for  $O_i$ ,  $d_f$  is the feature distance between its arguments,  $d_s$  is the similarity between the spatial-temporal structure in the template and that among matched objects in the video shot,  $\omega_f$  and  $\omega_s$  are the normalized weights for the feature distance and the structure dissimilarity. The query procedure is to generate a candidate list for each object in the query. Then, the distance  $D$  is the minimum over all possible sets of 25 matched objects that satisfy the spatial-temporal restrictions. For example, if the semantic template has three objects and two candidate objects are kept for each single object query, there will be at most eight potential candidate sets of objects considered in computing the minimal distance in Equation 1.

30 Given  $N$  objects in the query, this appears to require searching over all sets of  $N$  objects that appear together in a video shot. However, for computational economy, the following more economical procedure can be adopted:

1. Each video object,  $O_i$ , say, is used to query the entire object database, resulting in a list of matched objects which can be kept short by using a threshold.
- 35 Only objects included in this list are then considered as candidate objects matching

O<sub>i</sub>

2. The candidate objects on the list are then joined, resulting in the final set of matched objects on which the spatial-temporal structure relationships will be verified.

#### Template generation

5 Two-way interaction is used between a user and the system for generating the templates. Given the initial scenario and using relevancy feedback, the technique converges on a small set of icons that gives maximum recall. A user furnishes an initial query as a sketch of the concept for which a template is to be generated, consisting of objects with spatial and temporal constraints. The user can also specify 10 whether the object is mandatory. Each object has features to which the user assigns relevancy weights.

15 The initial query can be regarded as a point in a high-dimensional feature space into which all videos in the database can be mapped. For automatic generation of the set of test icons it will be necessary to make jumps in each of the features of each of the objects, after quantizing the space. For quantizing, a step size can be determined with the help of the weight that the user has specified along with the initial query, which weight can be regarded as a measure for the degree of relevancy attributed by the user to the feature of the object.. Accordingly, a low weight results 20 in coarse quantization and vice versa, e.g. when

$$20 \quad \Delta(\omega) = 1/(a \cdot \omega + b) \quad (2)$$

where  $\Delta$  is the jump distance corresponding to a feature,  $\omega$  is the weight associated with the feature, and  $a$  and  $b$  are parameters which are chosen such that  $\Delta(0) = 1$  and  $\Delta(1) = d_0$  which is a system parameter related to thresholding, set at 0.2 in a prototype system. Using the jump distance, the feature space is quantized into hyper-rectangles. 25 For example, for color the cuboids can be generated using the metric for the LUV space along with  $\Delta(\omega)$ .

To prevent the total number of possible icons from increasing rapidly, joint variation of the features is prevented, e.g. as follows:

- 30 1. For each feature in the object, the user picks a plausible set for that feature.
2. The system then performs a join on the set of features associated with the object.
3. The user then picks the joins that most likely represent variations of the object, resulting in a candidate icon list.

35 In a multiple object case, an additional join can be included in step 2 with respect to the candidate lists for each object. Once a list of plausible scenarios has

been generated, the system is queried using the icons which the user has picked. Using relevancy feedback on the returned results, with the user labeling the returned results as positive or negative, those icons are determined which result in maximum recall.

5        Concept Covers

Sufficiently many "coverings" are desired of a concept, for a user to search a database. Each covering can reside in a different feature space, e.g. a "sunset" may be described at the object level as well as the global level. A global-level description may take the form of a color or texture histogram. An object-level description may be 10 a collection of two objects such as the sky and the sun. These objects may be further quantified using feature level descriptors.

As illustrated by Fig. 2, a concept (e.g. *Sunset*) has two different kinds of conditions, necessary (N) and sufficient (S). A semantic visual template is a sufficient condition on the concept and not a necessary one, so that a particular SVT need not cover the concept to its full extent. Additional templates may be generated 15 manually i.e. as the user inputs additional queries. The task is undertaken for each concept. Necessary conditions can be imposed on a concept, thereby automatically generating additional templates, given an initial query template.

The user interacts with the system through a "concept questionnaire", to 20 specify necessary conditions for the semantic searched for. These conditions may also be global, e.g. the global color distribution, the relative spatial and temporal interrelationships etc. Once the necessary and sufficient conditions for the concept are established, the system moves in the feature space to generate additional templates, with the user's original one as a starting point. This generation is also 25 modified by the relevancy feedback given to the system by the user. By analyzing the relevancy feedback, new rules can be determined pertaining to the necessary conditions. These can be used further to modify the template generation procedure. The rules are generated by looking at the correlation between the conditions deemed necessary for a concept with the videos that have been marked as relevant by the user. 30 This principle of determining rules (or implications) is akin to the techniques found in "data mining" as described in the above-identified patent applications and in papers by S. Brin et al., "Dynamic Itemset Counting and Implication Rules for Market Basket Data", ACM SIGMOD Conference on Management of Data, 1997, pp. 255-246 and S. Brin et al., "Beyond Market Baskets: Generalizing Association Rules to 35 Correlations", ACM SIGMOD Conference on Management of Data, 1997, pp. 265-276.

### Rule Generation Example

A query, for a "crowd of people", in VideoQ is in the form of a sketch. The user has specified a visual query with an object, giving weights for color and size, but is unable to specify a more detailed description in the form of either texture (of the crowd) or the relative spatial and temporal movements that characterize the concept of *a crowd of people*. However, since he feels that the idea of a "crowd" is strongly characterized by a texture and by relative spatial and temporal arrangements of people, he lists them down as necessary conditions.

Through the process of feedback, the system identifies the video clips relevant to the concept that the user is interested in. Now, since the system knows that texture and the spatial and temporal arrangements are necessary to the concept, it seeks to determine consistent patterns amongst the features deemed necessary, amongst the relevant videos. These patterns are then returned to the user, who is asked if they are consistent with the concept that he is searching for. If the user accepts these patterns as consistent with the concept, then they will be used to generate new query templates, as illustrated by Fig. 3. Including this new rule has two-fold impact on query template generation, namely it improves the speed of the search and increases the precision of the returned results.

### Generating Concept Covers

The query defines a feature space where the search is executed. The feature space is defined by the attributes and relevancy weights of the visual template. In particular, the attributes define the axes of the feature space, and the relevancy weights stretch/compress the associated axes. Within this composite feature space, each video shot can be represented as a point in this space. The visual template covers a portion of this space. Since the visual template can differ in feature and in character (global against object level), the spaces that are defined by the templates differ and are non-overlapping.

Selection of a few features may be insufficient to determine a concept, but it may be adequately represented by a suitable selection differing as to weight, for example. Thus, a concept can be mapped into a feature space.

A concept is not limited to a single feature space nor to a single cluster. For example, with respect to the class of sunset video sequences, sunsets cannot be totally characterized by a single color or a single shape. Thus, it is important to determine not only the global static features and weights relating to a concept, but also those features and weights that can vary.

The search for concepts starts by specifying certain global constants. Through a context questionnaire, the number of objects in the search is determined, and the

global features that are necessary to each object. These represent constraints in the search process that do not vary.

A user gives an initial query specifying features and setting weights. A set intersection is taken with the set of necessary conditions defined by the user. The necessary conditions are left unchanged. Changes are made to the template based on changes to those features deemed sufficient. If the sets do not intersect, rules are derived that characterize the concept based on the necessary conditions and relevancy feedback.

The relevancy weight of each feature indicates the tolerance that the user desires along each feature. This tolerance is then mapped to a distance threshold along each feature, e.g.  $d(\omega) = 1/(a \cdot \omega + c)$ , defining a hyper-ellipsoid in the feature space searched in. The threshold determines the number of non-overlapping coverings possible. The number of coverings determines the size and number of jumps possible along that particular feature. The algorithm performs a breadth first search and is guided by three criteria:

First, the greedy algorithm going in the direction of increasing recall:

Compute all possible initial jumps.

Convert each jump into the corresponding visual template.

Execute the query and collate all the results.

Show the results to the user for relevancy feedback and chose those results that maximize incremental recall as possible points of subsequent query.

Second, a logarithmic search, as subsequent queries are searched by taking a smaller jump in a local region. The rationale is that the current query point produced good results and should be search carefully for further templates. Searching stops when enough visual templates have been generated to cover above 70 percent of the concept (i.e recall is above 70%).

Third, as the breadth first search often yields too many possibilities to examine at once, feature level distributions are used to guide the search. The distribution along each feature has been pre-calculated. This information is used to select jumps to regions that have a high concentration of video shots and avoid sparse ones.

#### Language Integration with SVT

Known text based queries on images and videos rely on matching on keywords accompanying the image or the video. Keywords accompanying the data can either be generated manually or are obtained by association, i.e. keywords are extracted from the accompanying text (in the case of an image) or the captions that accompany videos.

Such an approach precludes the possibility of any practical system containing

a very large database of videos or images for several reasons such as:

It is not feasible to generate annotations manually for the existing database of videos.

Most videos do not contain captions.

5 There may not be an immediate correlation between the accompanying caption and the video. For example, during a baseball game the commentators may be talking about the exploits of Babe Ruth, who is not present in the game that is being played, and a text-based keyword on locating videos containing "Babe Ruth" will incorrectly display this video.

10 Generating semantic content about a video by analysis of the video stream alone amounts to the computer vision problem which is known to be difficult. A more practicable approach is to simultaneously make use of the visual content such as the motion of objects, attributes like color and texture, with the descriptive power of natural languages.

15 The user types in a string, which the system parses into a video model. VideoQ provides a "language" for inputting the query, in terms of a sketch. There is a simple correspondence between what exists in VideoQ and its natural language counterpart, as illustrated by Table 1.

	<u>Attribute</u>	<u>NL Type</u>
20	Motion	Verb
	Color, Texture	Adjective
	Shape	Noun
	Spatial/temporal	Preposition/Conjunction

Table 1

25 A constrained language set can be used, with a set of allowable words. A sentence is parsed into classes such as nouns, verbs, adjectives, and adverbs to generate a motion model of the video sequence.

For example for the phrase "Bill walked slowly towards the sunset", the system can parse as shown in Table 2.

	<u>Word</u>	<u>NL-Type</u>
30	Bill	Noun
	Walked	Verb
	Slowly	Adverb
	Towards	Preposition
35	Sunset	Noun

Table 2

For verbs, adverbs, adjectives and prepositions, a small but fixed database can be used, as these are modifiers (or descriptors) on nouns (the objects). An noun (i.e. scenario/object) database may initially include a hundred scenes or so, and be extensible by user interaction.

5 Each object may have a shape description that is modified by the various modifiers such as adjectives (color, texture), verbs (walked), adverbs (slowly). This can then be inserted into the VideoQ palette, where it may be subject to further refinement.

10 When the parser encounters a word that is absent from its modifier database (i.e. the databases corresponding respectively to verbs, adverbs, prepositions, adjectives), it then looks up a thesaurus to determine if synonyms of that word are present in its database, and uses them instead. If that fails, it returns a message to indicate an invalid string.

15 When the parser encounters a word that it cannot classify, the user must either modify the text or, if the word is a noun (like "Bill"), then he can indicate to the system the class (in this case a noun), and additionally indicate that the word refers to a human being. If the user indicates a noun that is absent from the system databases, then the user is prompted to draw that object in the sketch pad so that the system can learn about the object. In the database, attributes such as motion, color, texture and shapes can be generated at the object level, so that one level of matching can be at 20 that level.

25 As a further source of information, the audio stream can be used that accompanies a video, as illustrated by Fig. 4. Indeed, if the audio is closely correlated to the video, it may be the single most important source of the semantic content of the video. From the audio stream, a set of keywords can be generated, 10-20 per video sequence, for example. Then the search at the keyword level can be joined to the search that at the model level. Those videos can then be ranked the highest which match at the keyword (semantic) level as well as the motion-model level.

## EXAMPLES

30 Semantic visual templates for retrieving video shots of slalom skiers.

1. The system asks and the user answers questions regarding context. The semantic visual template is labeled "slalom". The query is specified as object-based, including two objects.
2. The user sketches the initial query. The large blank background represents

the ski slope and the smaller foreground object the skier with its characteristic zigzag motion trail.

3. Maximum relevancy weights are assigned to all the features associated with the background and the skier. The background feature is specified to remain static while those of the skier can vary during template generation.

5 4. The system generates a set of test icons from which the user selects plausible feature variations in the skier's color and motion trajectory.

5 10 5. The four selected colors and the three selected motion trails are joined to form 12 possible skiers. The list of skiers is joined with the single background, resulting in the 12 icons of Fig. 7 where groups of three adjacent icons are understood as having the same color.

6. The user chooses a candidate set to query the system. The system retrieves the 20 closest video shots. The user provides relevancy feedback to guide the system to a small set of exemplar for slalom skiers.

15 Sunsets. A database was used which includes 72 sunsets in more than 1952 video shots. Using just an initial sketch, without semantic visual templates, a recall of 10 % and a precision of 35% were realized. Using semantic visual templates, 8 icons were generated, with which 36 sunset were found, for a recall of 50% and a precision of 24%.

20 High Jumpers. The database contains nine high jumpers in 2589 video shots. Without semantic visual templates, recall was 44% and precision 20%. With semantic visual templates recall was improved to 56% and precision to 25%. The system converged to a single icon different from the initial sketch provided by the user.

## CLAIMS

1. A computerized method for generating a visual template for a concept, comprising the steps of:

- a. obtaining at least one initial query for the concept;
- b. generating at least one additional query related to the initial query;
- c. producing the additional query for inspection for appropriateness with respect to the concept; and
- d. in case of appropriateness, including the additional query in the visual template for the concept.

10 2. The method of claim 1, wherein each query is represented by an icon/example image.

3. The method of claim 1, wherein the initial query is obtained via a sketchpad.

15 4. The method of claim 1, wherein generating the additional query comprises stepping a query feature with a step size which is inversely related to a weight associated with the query feature.

5. The method of claim 1, wherein generating the additional icon comprises forming a join of plausible feature values.

20 6. The method of claim 1, wherein appropriateness is ascertained by two-way user interaction.

7. A computerized method for querying a video database for a concept using a subset of a natural language in conjunction with semantic visual templates, comprising the steps of:

- a. obtaining a textual query;
- b. parsing the query to generate visual attributes;
- c. using the visual attributes for forming a visual query;
- d. using the visual query to retrieve information; and
- e. displaying the information.

30 8. The method of claim 7, wherein the textual query is obtained from a keyboard.

9. The method of claim 7, wherein the subset of the natural language comprises a small set of nouns, verbs, prepositions, adjectives and adverbs.

10. The method of claim 7, further comprising a step of expanding the subset in an interactive fashion.

5 11. The method of claim 7, wherein parsing comprises the steps of:

(i) establishing a correspondence between the query and the natural language subset;

(ii) labeling different parts of the query as a noun, verb, adjective or preposition; and

10 (iii) obtaining clarification if a word in the query is absent from the natural language subset and labeling the word accordingly.

12. The method of claim 7, wherein forming the visual query comprises the step of establishing a correspondence between the natural language subset and a set of semantic visual templates generated by the method of claim 1, with the semantic visual template being a visual embodiment of a noun in the query, an adjective serving to modify the visual embodiment of the nouns, a verb serving to embody an action, and a preposition serving to establish a spatial and temporal order needed in forming a visual query.

15 13. A computerized system for generating a visual template for a concept, comprising:

a. means for obtaining at least one initial query for the concept;

b. means for generating at least one additional query related to the initial query;

c. means for producing the additional query for inspection for appropriateness with respect to the concept; and

d. means in case of appropriateness for including the additional query in the visual template for the concept.

14. The system of claim 1, wherein each query is represented by an icon/example image.

15. The system of claim 1, wherein the means for obtaining the initial query comprises a sketchpad.

16. The system of claim 1, wherein generating the additional query comprises stepping a query feature with a step size which is inversely related to a weight associated with the query feature.
17. The system of claim 1, wherein generating the additional icon comprises forming a join of plausible feature values.
18. The method of claim 1, wherein appropriateness is ascertained by two-way interaction between the system and a user.
19. A computerized system for querying a video database for a concept using a subset of a natural language in conjunction with semantic visual templates, comprising:
  - a. means for obtaining a textual query;
  - b. means for parsing the query to generate visual attributes;
  - c. means for using the visual attributes for forming a visual query;
  - d. means for using the visual query to retrieve information; and
  - e. means for displaying the information.
20. The system of claim 19, wherein the means for obtaining the textual query comprises a keyboard.
21. The system of claim 19, wherein the subset of the natural language comprises a small set of nouns, verbs, prepositions, adjectives and adverbs.
22. The system of claim 19, further comprising means for expanding the subset in an interactive fashion.
23. The method of claim 19, wherein the means for parsing comprises:
  - (i) means for establishing a correspondence between the query and the natural language subset;
  - (ii) means for labeling different parts of the query as a noun, verb, adjective or preposition; and
  - (iii) means for obtaining clarification if a word in the query is absent from the natural language subset and labeling the word accordingly.
24. The system of claim 19, wherein the means for forming the visual query

comprises means for establishing a correspondence between the natural language subset and a set of semantic visual templates generated by the system of claim 13, with the semantic visual template being a visual embodiment of a noun in the query, an adjective serving to modify the visual embodiment of the nouns, a verb serving to embody an action, and a preposition serving to establish a spatial and temporal order needed in forming a visual query.

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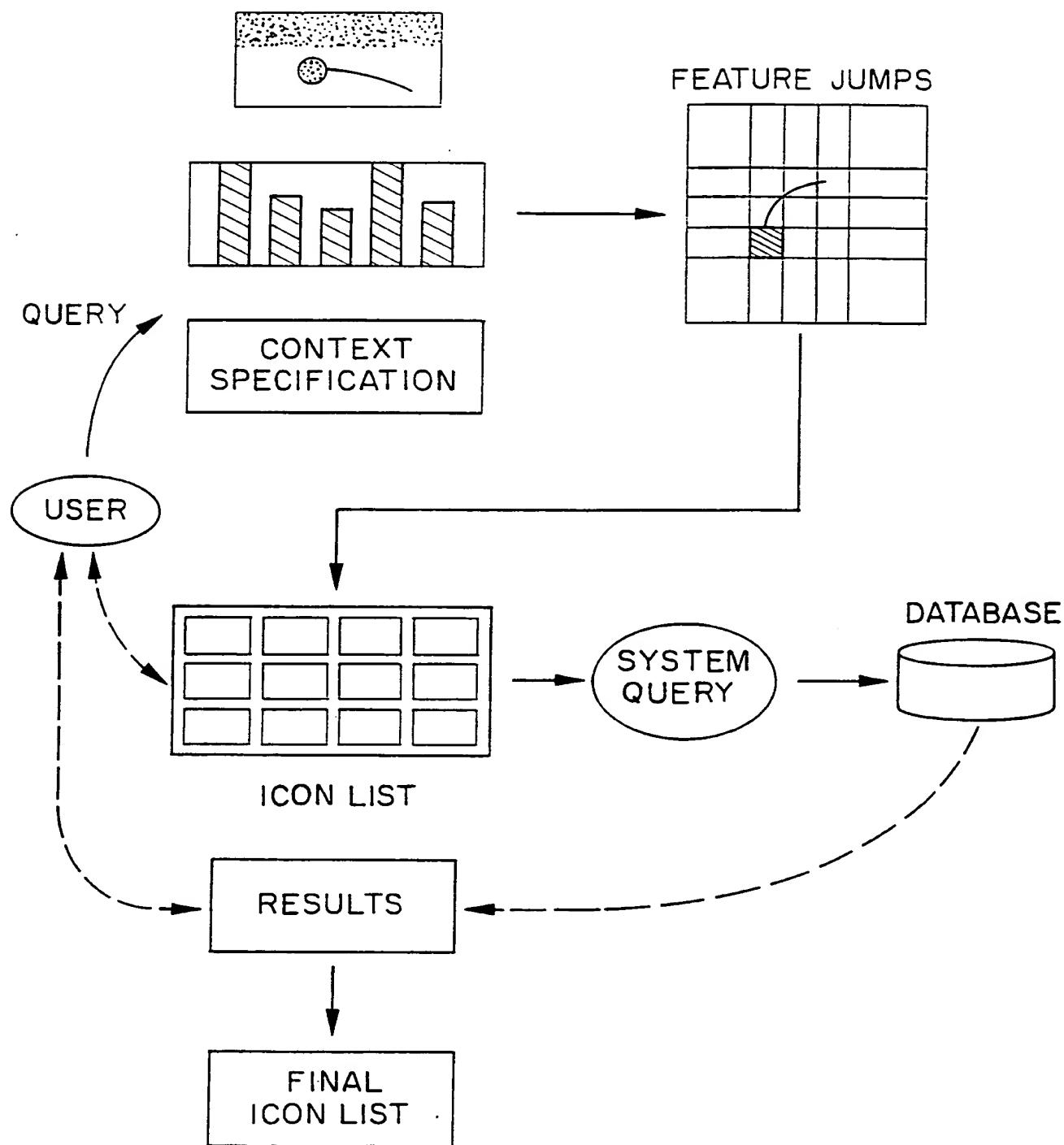


FIG. 1

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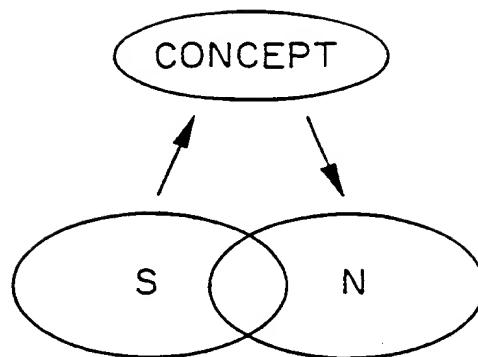


FIG. 2

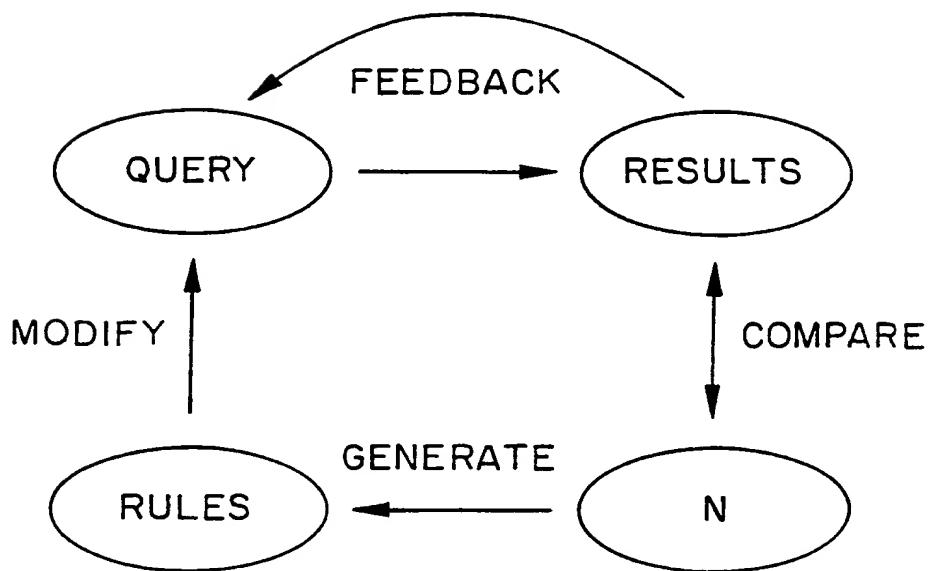


FIG. 3

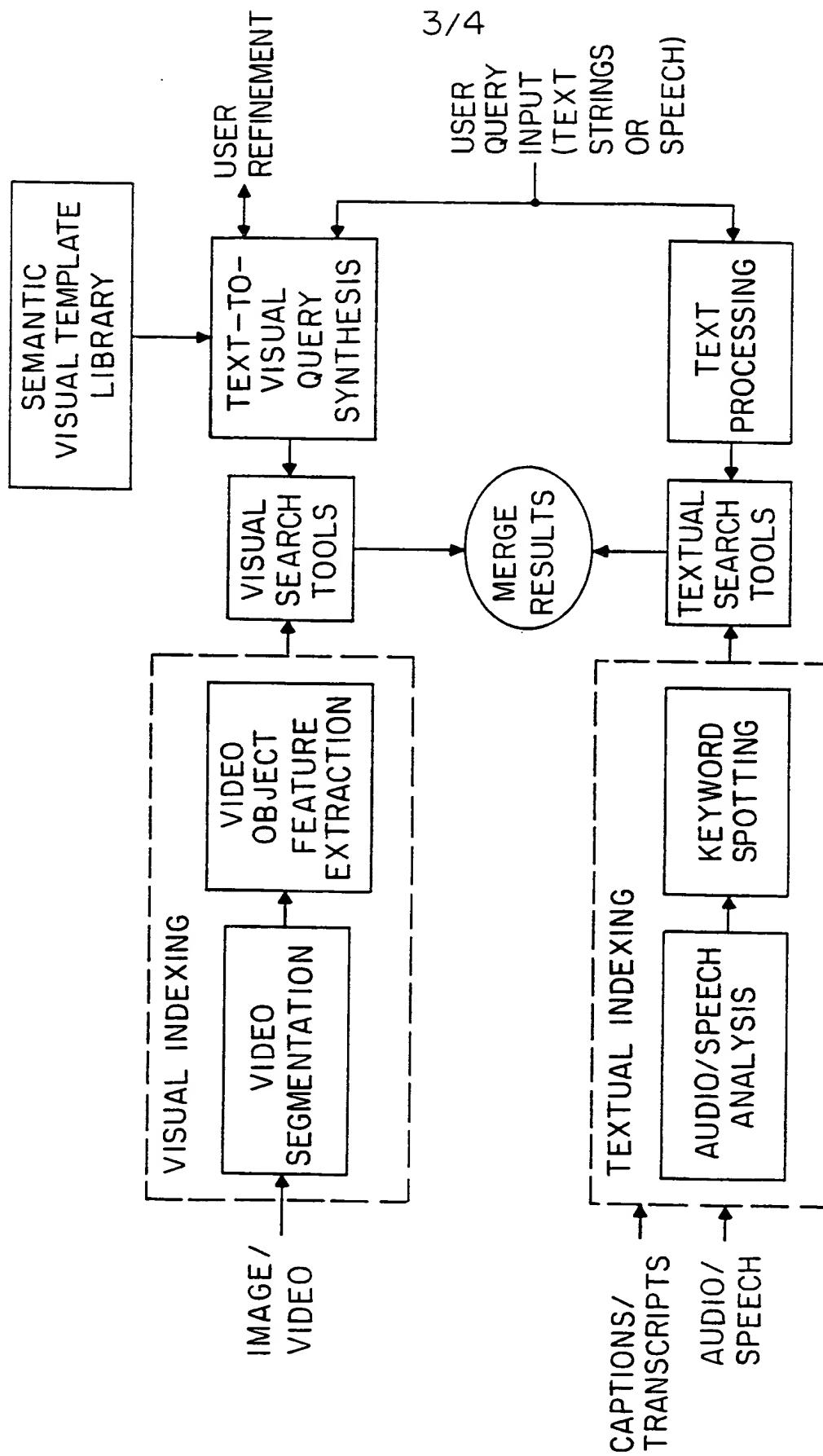


FIG. 4

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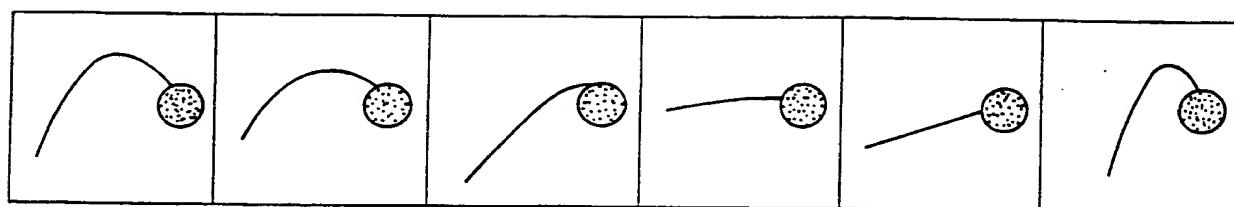


FIG. 5

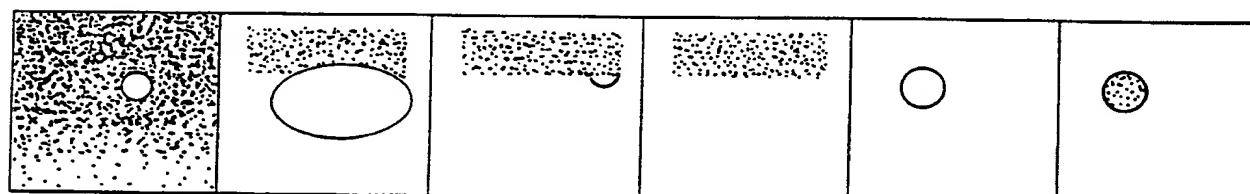


FIG. 6

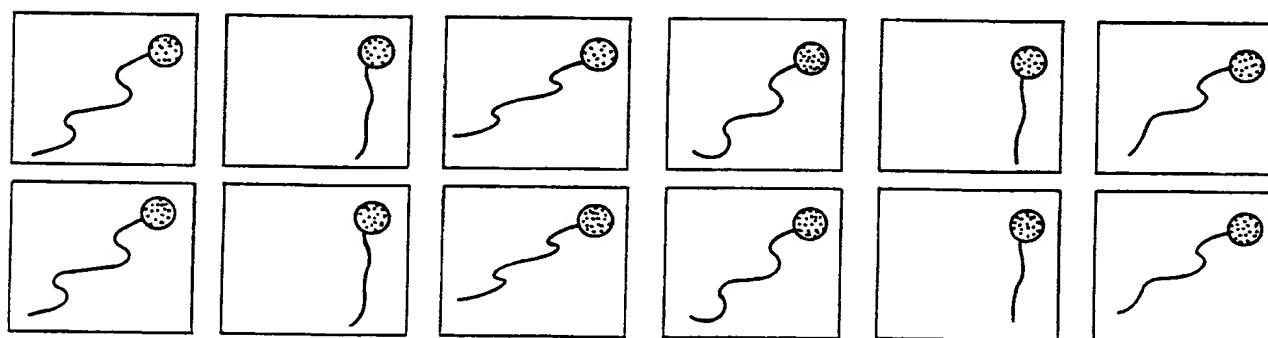


FIG. 7

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/04776

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G06F 17/30; 19/00  
US CL : 707/3,4,46,100,104

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 707/3,4,46,100,104

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS, IS&amp;R, EIC

SEARCH TERMS: VISUAL, IMAGE, NATURAL LANGUAGE, RETRIEVE, SVT

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,493,677 A (BALOGH et al.) 20 February 1996, col. 14, lines 40-59.	1-24
Y	US 5,724,484 A (KAGAMI et al.) 03 March 1998, col. 8, lines 47-60.	1-24
Y	US 5,708,805 A (OKAMOTO et al.) 13 January 1998, col. 1, lines 30-49.	1-24

 Further documents are listed in the continuation of Box C. See patent family annex.

• Special categories of cited documents:	
• "A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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• "P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

29 APRIL 1999

Date of mailing of the international search report

14 MAY 1999

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## PATENT COOPERATION TREATY

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00 JUL -5 PM 4:57

From the  
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To: HENRY TANG  
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(PCT Rule 71.1)

Date of Mailing  
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29 JUN 2000

Applicant's or agent's file reference  
31596-PCT

## IMPORTANT NOTIFICATION

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04 MARCH 1999

Priority Date (day/month/year)

04 MARCH 1998

Applicant

THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

ON DOCKET FOR  
9/14/00 *[Signature]*

Name and mailing address of the IPEA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

KIM VU

Telephone No. (703) 308-6718

PATENT COOPERATION TREATY

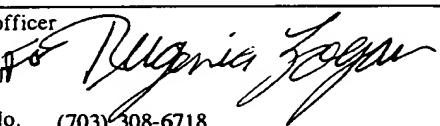
PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 31596-PCT	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US99/04776	International filing date (day/month/year) 04 MARCH 1999	Priority date (day/month/year) 04 MARCH 1998
International Patent Classification (IPC) or national classification and IPC IPC(7): G06F 17/30; 19/00 and US Cl.: 707/3,4,46,100,104		
Applicant THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK		

<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>4</u> sheets.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>0</u> sheets.</p> <p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the report</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of report with regard to novelty, inventive step or industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input type="checkbox"/> Certain defects in the international application</li> <li>VIII <input type="checkbox"/> Certain observations on the international application</li> </ul>
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Date of submission of the demand 22 SEPTEMBER 1999	Date of completion of this report 25 MAY 2000
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer KIM VU  Telephone No. (703) 308-6718
Facsimile No. (703) 305-3230	

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/04776

## I. Basis of the report

## 1. With regard to the elements of the international application: \*

 the international application as originally filed the description:

pages 1-12, as originally filed

pages NONE, filed with the demand

pages NONE, filed with the letter of \_\_\_\_\_

 the claims:

pages 13-16, as originally filed

pages NONE, as amended (together with any statement) under Article 19

pages NONE, filed with the demand

pages NONE, filed with the letter of \_\_\_\_\_

 the drawings:

pages 1-3, as originally filed

pages NONE, filed with the demand

pages NONE, filed with the letter of \_\_\_\_\_

 the sequence listing part of the description:

pages NONE, as originally filed

pages NONE, filed with the demand

pages NONE, filed with the letter of \_\_\_\_\_

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item. These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

 the language of a translation furnished for the purposes of international search (under Rule 23.1(b)). the language of publication of the international application (under Rule 48.3(b)). the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

 contained in the international application in printed form. filed together with the international application in computer readable form. furnished subsequently to this Authority in written form. furnished subsequently to this Authority in computer readable form. The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished. The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4.  The amendments have resulted in the cancellation of: the description, pages NONE the claims, Nos. NONE the drawings, sheets/fig NONE5.  This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/04776

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. statement**

Novelty (N)	Claims 1-18	YES
	Claims 19-24	NO
Inventive Step (IS)	Claims NONE	YES
	Claims 1-24	NO
Industrial Applicability (IA)	Claims 1-24	YES
	Claims NONE	NO

**2. citations and explanations (Rule 70.7)**

Claims 1-24 lack of inventive step under PCT Article 33(3) as being obvious over Balogh (US Pat. No. 5,493,677) in view of Okamoto (US Pat. No. 5,708,805).

As per claims 1, 7, 13, and 19 Balogh discloses a method comprising of obtaining at least one initial query for the concept (see, col. 15, lines 12-14);

generating at least one additional query related to the initial query (see, col. 3, lines 4-6);  
 producing the additional query for inspection for appropriateness with respect to the concept (see, col. 10, lines 23-28);  
 displaying the information (see, col. 17, lines 45-46). But, he does not specifically disclose a method of including the additional query in the visual template for the concept. However, Okamoto discloses a method of images contain more information and are more concrete or real than natural language, many images are employed in various documents (see, col. 1, lines 11-13).

It would have been obvious to a person of ordinary skill in the art at the time the Applicant's invention was made to modify the teachings of Balogh with including the additional query in the visual template for the concept as disclosed by Okamoto, because such modification would provide the system to the degree of similarity with the image retrieving information (see, col. 1, lines 54-56).

As per claims 2, 5, 14, and 17 Balogh discloses a method wherein each query is represented by an icon/example image (see, figure 14, col. 17, lines 14-16).

As per claims 3, 8, 15, and 20 Balogh discloses a method wherein the textual query is obtained from a keyboard (see, cols. 13, and 17, lines 43-53, and 2-6).

As per claims 4, 9, 16, and 21, the limitations of claims 4, 9, 16, and 21 have been mentioned in the analysis of claim 1 above. They are, therefore, lack of inventive step.

(Continued on Supplemental Sheet.)

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

**I. BASIS OF REPORT:**

5. (Some) amendments are considered to go beyond the disclosure as filed:  
NONE

**V. 2. REASoNED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):**

As per claims 6, 10, 18, and 22 Balogh discloses a method wherein appropriateness is ascertained by two-way interaction between the system and a user (see, abstract, lines 5-8).

As per claims 11, and 23 Balogh discloses a method wherein establishing a correspondence between the query and the natural language subset (see, col. 18, lines 38-45);

labeling different parts of the query as a noun, verb, adjective or preposition (see, col. 14, lines 40-59);  
obtaining clarification if a word in the query is absent from the natural language subset and labeling the word accordingly (see, col. 1, lines 9-12).

As per claims 12, and 24,  
the limitations of claims 12, and 24 have been noted in the analysis of claim 1 above. They are, therefore, lack of inventive step.

**-----NEW CITATIONS-----**

NONE

PCT/US/1999/20 (January 1994) \*

PATENT COOPERATION TREATY

99 MAY 20 AM 10:45

From the INTERNATIONAL SEARCHING AUTHORITY

To: HENRY TANG  
BAKER & BOTTS, LLP  
30 ROCKEFELLER PLAZA  
NEW YORK NY 10112-0228

PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT  
OR THE DECLARATION

(PCT Rule 44.1)

Date of Mailing  
(day/month/year)

14 MAY 1999

Applicant's or agent's file reference 31596-PCT	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/US99/04776	International filing date (day/month/year) 04 MARCH 1999
Applicant THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK	

1.  The applicant is hereby notified that the international search report has been established and is transmitted herewith.

**Filing of amendments and statement under Article 19:**

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the international search report; however, for more details, see the notes on the accompanying sheet.

**Where?** Directly to the International Bureau of WIPO

34, chemin des Colombettes  
1211 Geneva 20, Switzerland  
Facsimile No.: (41-22) 740.14.35

DOCKETED

FOR 7/14/1999 BY

For more detailed instructions, see the notes on the accompanying sheet.

2.  The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3.  With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
- no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in rules 90 bis 1 and 90 bis 3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231  
Facsimile No. (703) 305-3230

Authorized officer

PAUL R. LINTZ

Telephone No. (703) 308-6718

*Riccardo Zogno*

(See notes on accompanying sheet)

Form PCT/ISA/20 (January 1994) \*

HYT PAB MC 5/24/99

Ref in folder

**PATENT COOPERATION TREATY**

**PCT**

**INTERNATIONAL SEARCH REPORT**

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 31596-PCT	<b>FOR FURTHER ACTION</b>	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US99/04776	International filing date (day/month/year) 04 MARCH 1999	(Earliest) Priority Date (day/month/year) 04 MARCH 1998
Applicant THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1.  Certain claims were found unsearchable (See Box I).
2.  Unity of invention is lacking (See Box II).
3.  The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing
  - filed with the international application.
  - furnished by the applicant separately from the international application,
    - but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
    - transcribed by this Authority.
4. With regard to the title,  the text is approved as submitted by the applicant.
  - the text has been established by this Authority to read as follows:
5. With regard to the abstract,
  - the text is approved as submitted by the applicant.
  - the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:
 

Figure No. 1  as suggested by the applicant.  None of the figures.

because the applicant failed to suggest a figure.

because this figure better characterizes the invention.

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US99/04776

**Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)**

For database image/video retrieval, a semantic visual template (SVT) is a set of icons of example scenes/objects that characterize a concept, e.g. skiing, sunset and the like. SVT's provide for two-way interaction between a user and a system. The user can provide the system with an initial sketch or example image, as a seed to the system to automatically generate other representations of the same concept. The user then can pick those views for inclusion that are plausible for representing the concept. When an SVT has been established, the database can be searched with it, for the user to provide relevancy feedback on the returned results. With established SVT's, the user can interact with the system at concept level. In forming new concepts, pre-existing SVT's can be used. A limited vocabulary can be parsed, in conjunction with semantic visual templates for querying the system (figure 1).

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/04776

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G06P 17/30; 19/00  
US CL : 707/3,4,46,100,104

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 707/3,4,46,100,104

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS, IS&amp;R, EIC

SEARCH TERMS: VISUAL, IMAGE, NATURAL LANGUAGE, RETRIEVE, SVT

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,493,677 A (BALOGH et al.) 20 February 1996, col. 14, lines 40-59.	1-24
Y	US 5,724,484 A (KAGAMI et al.) 03 March 1998, col. 8, lines 47-60.	1-24
Y	US 5,708,805 A (OKAMOTO et al.) 13 January 1998, col. 1, lines 30-49.	1-24

<input type="checkbox"/>	Further documents are listed in the continuation of Box C.	<input type="checkbox"/>	See patent family annex.
*A*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"P"	document referring to an oral disclosure, use, exhibition or other means		
	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
29 APRIL 1999	14 MAY 1999
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer
Facsimile No. (703) 308-5403	PAUL R. LINTZ <i>Paula R. Lintz</i> Telephone No. (703) 305-3832

These Notes are intended to give the basic instructions concerning the filing of amendments under Article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule" and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

## INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Preliminary Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where Applicable, Article 41.

When ? Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

### Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been filed.

**How ?** Either by cancelling one or more entire claims, by adding one or more new claims or by amending the existing claims.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendment, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 20501).

The amendments must be made in the language in which the international application is to be published.

The amendments must be made in the language in which the international application is to be published.

11. What is your primary motivation for learning English?

What documents must/may accompany the amendments?

**Letter (Section 205(b)):**

The amendments must be submitted with a letter

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:  
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:  
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:  
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or  
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:  
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under Article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

#### Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

#### Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Office, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.